

NON-PUBLIC?: N  
ACCESSION #: 9308030024  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Millstone Nuclear Power Station Unit 2 PAGE: 1 OF 05

DOCKET NUMBER: 05000336

TITLE: Turbine and Reactor Trip During Mussel Cook (Thermal Backwash)  
EVENT DATE: 05/24/93 LER #: 93-012-01 REPORT DATE: 07/23/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(ii) and 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Zan Hoagland, Engineer, X 4725 TELEPHONE: (203) 447-1791

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On May 24, 1993, at 0943 hours, with the plant in Mode 1 at 100% power, a reactor trip occurred due to a turbine trip. The turbine trip was caused by high generator stator cooling water temperature resulting from mussel cooking (thermal backwash) operations on the 'B' condenser waterbox. During the subsequent transient, a malfunction caused the 'A' feedwater regulating valve to stay at approximately 56% open which caused the #1 steam generator water level to increase to the high level setpoint. The reactor operator tripped the running feedwater pump based on the high steam generator water level. Steam generator water levels were subsequently controlled using the auxiliary feedwater system. Operators performed Emergency Operating Procedure 2525, "Standard Post Trip Actions." All safety related equipment, with the exception of the main feedwater regulating valves, responded as expected and the unit was placed in a stable condition. During the event investigation subsequent to the trip, it was discovered that during the mussel cook, Reactor

Building Closed Cooling (RBCCW) temperatures momentarily exceeded 85 degrees F which potentially resulted in the plant being outside of its design basis. RBCCW temperatures immediately returned to normal.

These events are being reported pursuant to the requirements of Paragraph 50.73(a)(2)(iv) and Paragraph 50.73(a)(2)(ii)(B) reporting any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature System including the Reactor Protection system and to report an event or condition that potentially resulted in the nuclear power plant being in a condition outside the design basis of the plant.

END OF ABSTRACT

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#### I. Description of Event

On May 24, 1993, at 0920, with the plant at 100% power, mussel cooking (thermal backwash) operations on the 'B' waterbox were initiated. At approximately 0940 hours, the time limit for elevated temperature in the 'B' waterbox was satisfied and restoration of the waterbox was underway.

During the course of the restoration, the elevated temperature in the 'B' circulating water intake bay was affecting the service water temperature and Turbine Building Closed Cooling Water temperature. It was determined that the service water inlet isolation valves for the Turbine Building Closed Cooling Water (TBCCW) heat exchangers were restricting the now and heat removal capabilities. The service water inlet isolation valves were then opened from 30 degrees to 40 degrees open in response to elevated TBCCW temperatures.

Approximately 0940 hours, a common alarm for the main generator stator cooling cabinet was annunciated in the Control Room. A Plant Equipment Operator was dispatched to investigate this alarm. The main generator stator winding inlet temperature was found to be 51 degrees Celsius, which was above the alarm setpoint of 47 degrees Celsius. This condition was reported to the Shift Supervisor by the Plant Equipment Operator. When the Plant Equipment Operator returned to the main generator stator cooling cabinet, the "Generator Protection Trip Circuit Energized" alarm was observed to be annunciated followed shortly by the turbine trip. When the alarm energized, the process computer indicated that the stator cooling water heat exchanger outlet temperature was 75 degrees Celsius. The setpoint for the "Generator Protection Trip Circuit Energized" is 81

degrees Celsius.

The feedwater regulating valves receive a ramp close signal as part of the normal trip response. During the subsequent transient, a malfunction caused the 'A' feedwater regulating valve to stay at approximately 56% open causing the #1 steam generator water level to increase to the high level setpoint. In response to this condition, the reactor operator closed the bypass valve and the blocking valve for the 'A' feedwater regulating valves. Then the 'B' steam generator level went high. The 'B' feedwater regulating valve indicated 10% open. The bypass valve and the blocking valve for the 'B' feedwater regulating valves were closed. Additionally, the reactor operator tripped the running feedwater pump based on the high steam generator water level. Steam generator water levels were subsequently controlled using the auxiliary feedwater system. Operators performed Emergency Operating Procedure 2525, "Standard Post Trip Actions." All safety related equipment responded as expected with the exception of the main feedwater regulating valves and the unit was placed in a stable condition.

During this transient, the Reactor Building Closed Cooling Water (RBCCW) System reached a temperature of 97 degrees Fahrenheit. The maximum normal operation RBCCW discharge temperature is 85 degrees Fahrenheit when the RBCCW heat exchangers are cooled by service water up to a maximum temperature of 75 degrees Fahrenheit.

## II. Cause of Event

1. The reactor trip was caused by a turbine trip. The root cause of the turbine trip was the lack of heat removal capabilities from the Main Generator Stator Water Cooling System. The warm water being discharged through the 'B' circulating water pump into the 'B' intake bay was being recirculated to the 'A' and 'C' intake bays, causing an increased service water temperatures. The tide was a significant factor in the high service water temperature. The low incoming tide allowed the 'B' intake bay's high temperature to cause an aggravated effect on the adjacent bays. Some temperature stratification in the adjacent bays has been observed on previous mussel cooks. The low tide placed the higher temperature water at the suction of the Service Water pumps,

During the mussel cooking operations, all components cooled by the TBCCW System experienced elevated temperatures. The Main Generator Stator Cooling Water outlet temperature increased greater than the temperature switch setpoint, 81 degrees

Celsius, for greater than 70 seconds which resulted in a Turbine trip.

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2. The root cause of the 'A' feedwater regulating valve was vibration which caused the valve to go into local manual control. The 'B' feedwater regulating valve was 10% open due to the valve stroke being out of calibration.

3. The root cause of the high RBCCW temperatures was a lack of procedural guidance to address the 85 degrees Fahrenheit RBCCW temperature limitation.

### III. Analysis of Event

These events are being reported pursuant to the requirements of Paragraph 50.73(a)(2)(iv) and Paragraph 50.73(a)(2)(ii)(B) reporting any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature System, including the Reactor Protection System and to report an event or condition that potentially resulted in the nuclear power plant being in a condition outside the design basis of the plant.

There were no safety consequences from this reactor trip event. All safety equipment with the of one of the main feedwater regulating valves, responded as expected and plant operators executed applicable Emergency Operating Procedures accordingly. All cooling water temperatures immediately returned to their normal values.

### IV. Corrective Action

1. Post trip data review identified that the Main Generator Stator Cooling Water outlet temperature, as monitored by a Resistance Temperature Device (RTD), only reached a maximum of the equivalent of 75 degrees Celsius, below its computer alarm setpoint and the trip setpoint value of 81 degrees Celsius. The trip is initiated by a separate temperature switch. During the subsequent shutdown, the Main Generator Stator Water Cooling water outlet temperature switch calibration was checked and was found to operate within allowable ranges. Additionally, the stator water temperature RTD calibration was checked. It was found acceptable. It was determined that the clearance between the RTD and the inner diameter of thermowell was excessive. This would cause a time delay for the indicated temperature to read the actual temperature. A

thermoconductivity filler was installed in the thermowell, and the RTD was reinstalled. The presence of this gap explained the temperature discrepancy observed between the stator cooling outlet temperature temperature switch, trip setpoint and the stator cooling temperature, RTD, indication recorded by the process computer.

To prevent recurrence of this event, procedure enhancements have been included in the Service Water System and the Circulating Water System procedures.

2. The feedwater regulating valves hand wheels were mechanically secured to prevent the large handwheel from vibrating to the manual engagement point. A design change is being evaluated for the next refuel outage.

On the 'B' feedwater regulating valve, a calibration of the positioner and the position indication circuit was performed. The valve was stroked from the Control Room to verify the stroke and the position indicator. The valve was verified satisfactory.

3. Upon mussel cook restoration, the Service Water temperature decreased to its normal value. To prevent recurrence of this condition, procedure changes have been made to secure mussel cooking if RBCCW temperature reaches greater than 83 degrees Fahrenheit.

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## V. Additional Information

Similar LERs: None

EIIS Codes for referenced components:

- o Main Feedwater Regulating Valves: SJ-FCV-C635
- o Main Feedwater Regulating Bypass Valves: SJ-FCV-C635
- o Stator Cooling Water Outlet Temperature Switch: TJ-TS-G084
- o Turbine Building Closed Cooling Water Heat Exchangers KB-HX-S308
- o Main Feedwater Blocking Valve: SJ-ISV-C684
- o Auxiliary Feedwater Pump: BA-P-1075
- o Main Feedwater Pump: SJ-P-1075
- o Main Generator Stator Cooling Water Heat Exchanger: TJ-HX-G084

o Main Generator Stator Cooling Water RTD TJ-23-G084  
o Reactor Building Closed Cooling Water Heat  
Exchangers CC-HX-S445

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Figure "Mussel Cook (Thermal Backwash) Lineup" omitted.

ATTACHMENT 1 TO 9308030024 PAGE 1 OF 1

NORTHEAST UTILITIES

The Connecticut Light And Power Company  
Western Massachusetts Electric Company  
Holyoke Water Power Company  
Northeast Utilities Service Company  
Northeast Nuclear Energy Company

General Offices o Selden Street, Berlin Connecticut

P.O. BOX 270  
HARTFORD, CONNECTICUT 06141-0270  
(203)665-5000

July 23, 1993  
MP-93-590

Re: 10CFR50.73(a)(2)(iv)  
10CFR50.73(a)(2)(ii)(B)

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Reference: Facility Operating License No. DPR-65  
Docket No. 50-336  
Licensee Event Report 93-012-01

Gentlemen:

This letter forwards an update to Licensee Event Report 93-012-01.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: Stephen E. Scace

Vice President - Millstone Station

BY: Harry F. Haynes  
Millstone Unit 1 Director

SES/ZH:bjo

Attachment: LER 93-012-01

cc: T. T. Martin, Region I Administrator  
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2  
and 3  
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

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